

Designer Babies: Fact or Fiction

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Introduction

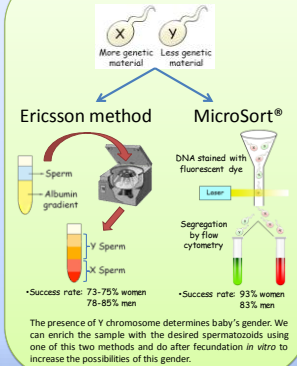
The new technologies in reproductive biology opens a lot of possibilities, one of this may be the selection of phenotypic traits in babies. Using Preimplantation genetic diagnosis (PGD) and screening genetic variants by microarrays or another genomic analysis we could be able to select children with the features desired by parents. Now, the question is whether this is really possible genetically. This review aims to analyze the genetics of several traits and discuss the possibility of being selected in embryos. Finally, consider an ethical evaluation to explore the consequences and the advantages of this practice.

Methods

Bibliographic search of genetic determination of the traits in study and discussion about if it's possible to select in embryos.
If it's possible, explain methods to do it.

Potential traits in demand

Gender determination

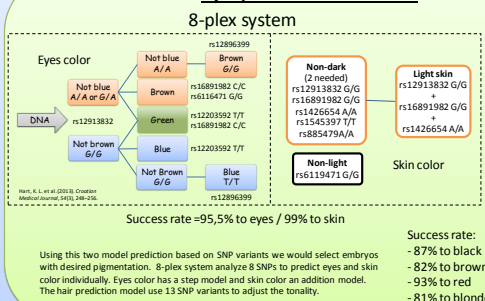


Anthropometric traits

Height Weight (IMC)

- Heritability = 90%
- >180 loci implicated
- Known loci = 10% phenotype variation
- Heritability = 40-70%
- >40 known loci ≠ heritability
- FTO (1%): food intake (±3kg)
- MC4R (1%): fat intake

Eyes, hair and skin color



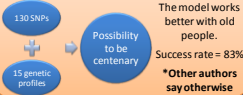
- Possible to select
- Not possible to select
- Maybe possible

Intelligence

- Difficult definition of trait
- IQ scores = approximation
- GWAS with 500,000 babies
- Found 7,000 markers
- 6 positives to IQ
- 1 significant SNP
- 0.4% total variation

Longevity

Genetic factors = 20-30% of variability
Predictive model to reach 100 years old:



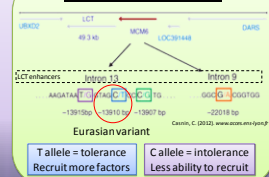
Physical performance

• Heritability = Unknown
• >220 loci implicated (18 mitochondrial)

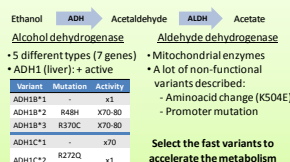


Other traits on supply

Lactose tolerance



Alcohol metabolism



Conclusions

- The selection is possible but not for all traits
- A trait selection depends of its genetic determination and if the alleles wanted are in parent's genotypes.
- DGP Success rate is low and complicates the practice
- Maybe in future we will discover new genes or alleles
- Ethics and legal considerations need to be solved

Ethical implications

Pros

- The selection of a couple or a no-disease phenotype in embryo are not considered an unmoral practice
- "Genes determine who we are" vs "who we are is a result of multiple genes and environment interaction"
- Only give them the potential but they can choice who they will be
- Beneficial traits vs trivial traits
- The enhancement of society

Cons

- Who could have access to this technology? This could create a social segregation and discrimination.
- Babies like another manufactured consume product of capitalism
- Where is the limit between acceptable and unacceptable? What traits could be selected?
- Is secure this practice? The "Slippery slope" problem.

Further readings

- Hart, K. L. et al. (2013). *Croatian Medical Journal*, 54(3), 248-256. doi:10.3325/cmj.2013.54.248
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- Zimmer, C. (2008). *Scientific American*, (October).